THE EXOTIC BEE *HALICTUS SMARAGDULUS* VACHAL, 1895 (HYMENOPTERA: HALICTIDAE) IN THE HUNTER VALLEY, NEW SOUTH WALES: A NEW GENUS IN AUSTRALIA

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Abstract

The emerald furrow bee, *Halictus smaragdulus* Vachal, 1895, native to the western Palaearctic, is recorded from the Upper Hunter Valley region, New South Wales, Australia. *Halictus* Latreille is a genus previously unknown in Australia. The bee is well established in the area and has been observed visiting flowers of exotic plants, including *Galenia pubescens* - a declared noxious weed.

Introduction

Several specimens of an unfamiliar bee were collected as part of research by JRG investigating the response of terrestrial invertebrates to riparian habitat rehabilitation in the Upper Hunter region of New South Wales (Fig. 1 inset). These small bees were similar in size and colour to *Lipotriches flavoviridis* (Cockerell, 1905a), but with the divided prepygidial fimbria characteristic of the subfamily Halictinae (Fig. 2). They were identified as a species of *Halictus* Latreille, a genus previously unknown in Australia.

The bees were further identified as belonging to *Halictus* subgenus *Seladonia* Robertson by Dr Ken Walker (Museum Victoria) and Dr Laurence Packer (York University, Canada) and named as *Halictus (Seladonia) smaragdulus* Vachal, 1895 by Fr Andreas Ebmer (Puchenau, Austria), an expert on *Seladonia* taxonomy. The species has since been added to the Australian Faunal Directory (Walker 2006a) and Australia's Pest and Diseases Image Library [PaDIL] (Walker 2006b). Diagnostic images can be found on the PaDIL website (Walker 2006b).

Identification, distribution and biology

Halictus smaragdulus is a metallic green bee, 6-8 mm long. It is native to the western Palaearctic, from Spain and Portugal in the west, through southern and central Europe, to Kyrgyzstan and Afghanistan in the east (Dawut and Tadauchi 2002). In Germany it is known as the Smaragdgrüne Furchenbiene, which translates as the emerald furrow bee, an appropriate vernacular name for use in Australia. Although there are few published flower-visiting records, *H. smaragdulus* is probably polylectic and has been recorded visiting *Asparagus aphyllus* and *Thymus capitatus* in Europe (Herrera 1988, Petanidou and Vokou 1993).

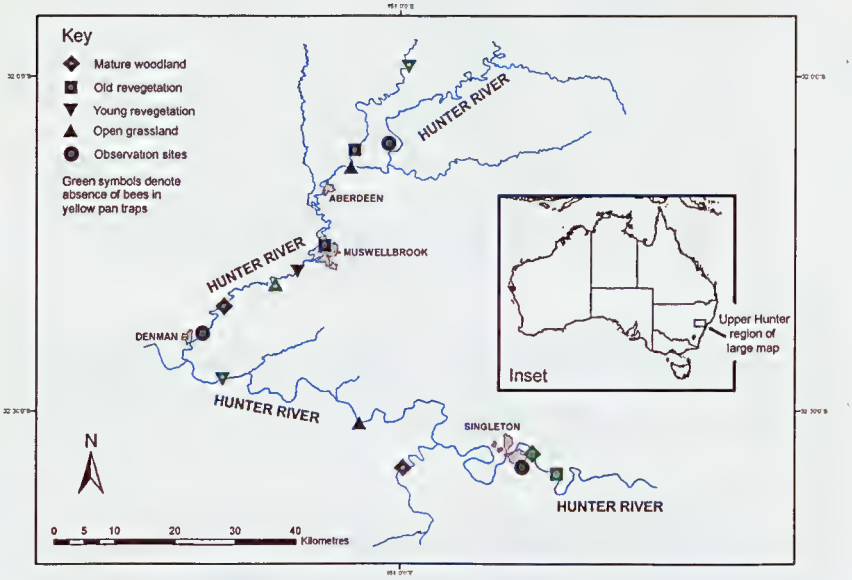

Fig. 1. Distribution of *Halictus smaragdulus* in the Upper Hunter Region, NSW.

Fig. 2. Female *Halictus (Seladonia) smaragdulus* Vachal from the Upper Hunter Region, NSW, Australia. Scale bar = 2 mm.

Most of the 360 species of Australian halictids belong to the genus *Lasioglossum* Curtis (251 species) or its close relative *Homalictus* Cockerell (39 species). *Halictus smaragdulus* is identifiable as belonging to the subfamily Halictinae by its wing venation and divided prepygidial fimbria, as described by Michener (2000). Females may be distinguished from other Australian halictines by the presence of apical bands of dense setae on the metasomal tergites and the strongly sclerotised third submarginal crossvein of the forewing. Males of *H. smaragdulus* can also be identified by the well developed lower gonostylus, illustrated by Ebmer (1998) and Dawut and Tadauchi (2002). It has been suggested the subgenus *Seladonia* should be raised to generic rank (Pesenko 2000), but this does not appear to have received universal acceptance. Dawut and Tadauchi (2002) provided a detailed redescription of the species.

The family Halictidae includes roughly 20% of all bee species known in Australia, as estimated from the Australian Faunal Directory (Walker 2006a). Most species nest in the ground (Michener 2000). About 25% of all species, but probably none of the Australian species (Walker 1986), form eusocial colonies, while others exhibit varying degrees of parasocial behaviour (Michener 1990). Fourteen species of subgenus *Seladonia* are known to be eusocial (Pesenko 2000). *Halictus smaragdulus* is probably similar to other *H. (Seladonia)* species described by Yanega (1997), with a caste system of queens and workers. Members of different castes may be indistinguishable morphologically and an individual female may change her caste during her lifetime (Michener 1990).

Occurrence in Australia

Invertebrates were surveyed by JRG in the Upper Hunter region, as part of a PhD investigating responses of invertebrates to riparian habitat rehabilitation. Yellow pan trapping was undertaken at 12 locations in November 2004 and January 2006. Four types of habitat were sampled: *open grassland*; *young revegetation* with native saplings planted in the last 4 years; *old revegetation* with native saplings planted 10-15 years ago; and *natural mature woodland*. Study locations were not regularly spaced but were approximately 5 km apart along the river (Fig. 1).

Eight yellow pan traps (plastic bowls 17 cm in diameter and 5 cm deep, *Deeko*™) were placed approximately 10 m apart at each site. All traps were half filled with a dilute solution of brine and 2-3 drops of detergent, secured on the ground using wooden food skewers and collected after 48 hours.

Six hundred and thirty nine bees, representing 17 species, were collected, of which *Halictus smaragdulus* comprised 22% of the total abundance and was the second most abundant species collected. Other abundant species trapped were *Homalictus sphecodoides* (Smith, 1853) [32%] and *H. caloundrensis* (Cockerell, 1914) [21%].

Halictus smaragdulus was trapped at seven of the 12 sampling sites (Fig. 1), with two sites yielding the majority of specimens. One of these sites was an open grassland habitat, located just northeast of Aberdeen on Fig. 1 (32°08'S 151°55'E), which was dominated by exotic pasture grasses and herbs such as *Galenia pubescens* and *Foeniculum vulgare*. The second site where abundance of *H. smaragdulus* was high was an old revegetation site at Muswellbrook (32°15'S 151°53'E), which had been planted with native trees typical of riparian zones in the region. Species planted included *Eucalyptus camaldulensis, E. tereticornis*, *E. melliodora*, *Casuarina glauca* and *C. cunninghamiana* subsp. *cunninghamiana*. The understorey was dominated by exotic pasture grasses and herbs like those of the other open grassland sites. The remaining five sites where *H. smaragdulus* was trapped produced 19 individuals.

Following discovery of the species, MB visited the Upper Hunter region on two occasions, in 2005 and 2007. At Denman in April 2005, *H. smaragdulus* of both sexes were observed visiting roadside flowers of the introduced plant *Galenia pubescens*. MB estimated that the density of bees was greater than 10 per m^2 over an area of at least 30 m^2. A similar density of the native species *Ceylalictus perditellus* (Cockerell, 1905b) was present. In January 2007, aggregations of *H. smaragdulus* were found on the exotic flower *Convolvulus mauretanicus* at Singleton (32°35'S 151°11'E) and on the exotic *Verbena bonariensis* at Glenbawn Dam (32°06'S 150°59'E). Nests were not found at any of the locations but were probably within 100 m of the observed bees (Greenleaf *et al.* 2007).

Discussion

Halictus smaragdulus appears well established in the Upper Hunter region of New South Wales. In the survey using yellow pan traps, *H. smaragdulus* was the second most abundant bee species trapped. Yellow pan traps may be an efficient method of trapping this exotic bee, particularly where standardised counts are required.

Given that *H. smaragdulus* is native to European regions that have a climate much like temperate Australia, we think that this species has potential to spread (and may already be present) over a much wider area (north, south, east and west) than was observed in our study. Furthermore, many of Australia's introduced weeds, many of which are European, may also provide a suitable food source for the bees. *Halictus smaragdulus* was trapped and observed in habitats that ranged from open grassland to mature woodland, including roadside verges. Two sites yielded much higher numbers than other sites. This may denote some preference trend or signify where the bees have been established for a longer period. However, patterns observed in our yellow pan survey could also be the result of natural spatial variability. More dedicated research is required to determine the actual extent of the incursion and on the spatial and temporal variation in abundance.

While we are unaware of any records of *H. smaragdulus* causing ecological problems outside Australia, this species has potential to be very successful in Australia. The possible undesirable effects of an explosion in the population of *H. smaragdulus* would include competition with native species for limited resources and transmission of parasites or pathogens to native organisms. Inaction or slow reaction to the discovery of *H. smaragdulus* may also result in irreversible environmental damage and species extinctions. Our opinion is that *H. smaragdulus* also has great potential to spread exotic plants. *Halictus smaragdulus* was observed visiting flowers of several exotic species, including *Galenia pubescens*. This plant is a declared noxious weed in NSW (under the Noxious Weeds Act 1993), requiring management plans to control its spread in two regions immediately north of the study region (MacDonald 2006). Prioritising exotic species for management or policy actions (control, removal or prevention) is not an easy task, but guidelines to direct research are available (*e.g.* Byers *et al.* 2002).

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